

Engineering with Redstone

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If you want to get as advanced as possible in Minecraft, redstone is where it's at. Doors that automatically open, switch-controlled lights, farms that harvest themselves – it's all possible with redstone.

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The easiest way to think about redstone is in terms of electrical devices. Redstone components like levers are just like switches on real-world devices and redstone dust is laid down in the game like electrical wiring.

Although that seems pretty simple, you can string together redstone components together to create very complex things. One British teenager even [built a working graphing calculator](#) with a display out of redstone.

As you can imagine, the kind of folks that find themselves drawn to a game where you can build just about anything from blocks are oftentimes the same kind of folks that love building and experimenting with just about anything: electrical circuits included.

The material is so versatile and the applications so diverse you could easily write a textbook-size tome just on the subject of redstone theory, design, and application. So, while we're going to do our best to give you a taste of what redstone can do, we'd strongly encourage you to fire up your favorite search engine or head over to YouTube and look up redstone tutorials if our overview appeals to you.

There is a staggering number of really neat things you can with redstone that range from improving your efficiency in Survival Mode to building really fun games and mega structures in Creative Mode.

Familiarizing Yourself with the Materials

The best way to get a feel for redstone is to load a Creative Mode game and open up the redstone tab in the Creative Mode inventory, seen below:



Redstone is named such because the principle component of most redstone creations is the redstone dust: a valuable material collected by mining redstone ore blocks. Even players who don't get into building elaborate redstone creations will still use redstone to create some of the more advanced tools in the game like the clock and compass. It's also used as an ingredient in a handful of potions.



Redstone use falls into two distinct categories: using redstone to make redstone devices like the clock and compass seen above, and redstone circuit components like repeaters, pistons, and dispensers (the circuit components are used to build more elaborate devices).

What kind of elaborate devices?

As we mentioned in the introduction to this lesson, creative players have crafted some truly remarkable redstone devices that are quite sophisticated including replicas of early computer CPUs, graphing calculators, and elaborate creations that can perform complex tasks like elevators, drawbridges, and such.

If you want to be wowed by just how far people have stretched the boundaries of Minecraft, hit up YouTube and search for redstone inventions. We've been playing Minecraft quite a long time, and we're still continually astounded at all the creative devices dedicated players build!

Those kind of exercises are obviously adventures in Creative Mode (we'd be more than impressed by someone that built a 20,000+ block computer in Survival Mode, that's for sure) but that doesn't mean you can't deploy some redstone tricks in Survival Mode. Before we start showcasing some simple Survival Mode tools, let's learn about some of the individual components.

Switches, Levers, and other Triggers

There are several redstone components that fall into the category of simple mechanical devices such as the lever, button, pressure plate, and tripwire. These items do exactly the kinds of things you'd anticipate them to do. Triggering the component activates the attached circuit. Remember the traps in the Temples we learned about in an earlier lesson? The TNT trap in the Desert Temple is simply a pressure plate on a pile of TNT and the traps in the Jungle Temple are tripwires connected to a dispenser (another redstone device) that "dispenses" arrows by shooting them at you.

Although not activated by the player or a mob, daylight sensors fall into the trigger category too. They toggle the circuit on and off based on the amount of light falling on the sensor. You could use such a circuit to create a lighting system for your base that turned on at night.

Hoppers, Droppers, and Dispensers

Hoppers are some of our favorite redstone components because they make it really easy to create collection points. Anything that goes into the top of a hopper gets passed onto whatever is at the bottom of the hopper.

Remember our mob farm that dropped hostile mobs to their death? If you line the bottom of that fall shaft with hoppers you can then point the hoppers into a chest and the mob farm will automatically collect the loot for you.

Related to hoppers are droppers and dispensers which do exactly what they sound like they do. Load them up with stuff and they will drop and dispense the loot when triggered by a redstone switch or circuit.

Pistons and Doors

Pistons can move things up, to the side, and in the case of sticky pistons, even up. While they can be used for a wide variety of tasks one of the most immediate applications for survival players (especially in multiplayer games) is creating a hidden door that blends into the surroundings.

Doors are included in the redstone menu because they too can be acted upon by redstone circuits. While you can open a wood door with your hands, iron doors crafted using the same door recipe but with iron, require a switch to open and close.

Repeaters and Comparators

Repeaters are the easiest to understand of these two components: they simply repeat the signal forward with or without a delay. If you lay a trail of redstone dust on the ground you can only use it as a power source for your circuit for 15 squares before it grows too weak to power the circuit. Adding a repeater in there, just like with a telecommunications signal like your Wi-Fi network, boosts the power and keeps the circuit operational.

Comparators are where you start to get the sense that you might just be working your way through an electrical engineering degree. Comparators are used to compare signals, subtract signals, and to measure containers.

A very simple example of a comparator in action would be that of an alert light attached to a collection container. Let's say you added a hopper and chest to that mob farm we were just talking about. What if the chest filled up and you weren't there to empty it? You'd lose all the future loot as it wouldn't be collected in the chest. You could set up a redstone circuit with a comparator that, when the chest was partially full, turns a light on outside the mob farm so you know to go empty the chest.

Examples of Simple Redstone Constructions

Talking about the individual components is all well and good, but it helps to see some examples to get a sense of context. Let's take a look at a few simple examples of redstone circuits to highlight what can be done with it.

Here's the most simple of constructions and one that will be readily familiar to even those of us without electrical engineering degrees:



The good old switch and light setup: you flick the switch and the light toggles its state. By building on that simple concept and adding in additional wiring, delays, and other mechanisms like pistons, you can really enhance your abilities in the game and save a lot of time in the process.

One of the earliest redstone devices we ever created was born out of frustration. We were exploring a particularly challenging series of Abandoned Mineshafts and cave systems and were annoyed how long it took to suit up with new gear (armor and weapons) in order to rush back into the mine to retrieve our lost loot. After a little brainstorming we came up with this design:



It's a set of six dispensers with a pressure plate in the center. When you step onto the pressure plate, the dispensers trigger and shoot out all four pieces of iron armor plus weapons to immediately armor and arm you.

Here's what it looks like if you break the wall away to see inside the guts of the device:



The design is quite simple. Redstone dust connected to the pressure plate at the back of the dispensers. The repeater, typically used to boost signal strength, are just there to act as spacers so the redstone “wire” doesn’t short circuit. It is activated when you step on the plate and the dispensers spring into action flinging the armor and weapons onto your body.

Although the above example has the classic redstone-as-wire configuration, not all redstone creations are necessarily wired-together type creations. One of our favorite redstone creations uses some redstone pieces that are more mechanical-like than electrical-like: hoppers and levers.

Here’s how you craft a lever and hopper:



And here our favorite creation is in all its glory:



It's an automatic furnace. Remember back in the Survival Mode tutorial when we learned how to cook food and smelt iron in the furnace? This simple little device allows us to load up a chest with stuff-to-be-cooked and it will automatically feed it into the furnaces and then into a storage chest.

Raw pork, iron ore, and the like, goes in the top, cooked pork and iron ingots pile up in the chest below. As long as there is fuel, stuff to cook, and space in the storage chest at the bottom, it just keeps chugging along. The levers turn the individual loading processes on and off. Let's look at the back to get a better peek at how it works.



Hoppers are like funnels. Anything on top (either dropped in or fed by a chest) is moved to an available slot in the device the hopper is connected to. The device above has hoppers to feed the food/ore from the top chest into the top of the furnaces, hoppers to move fuel from the little baby chests on the side into the furnaces, and then hoppers for the furnaces to drop the cooked food/ingots into, in order to feed them to the storage chest.

It's a simple and inexpensive design to build and shows how a little redstone tinkering can really speed up your workflow in Survival Mode, so you can get back to more important tasks like building the most awesome tree fort ever!

Although we talk about redstone casually now, working with redstone can be really frustrating when you're learning the ropes. Rather than grind through a bad design and several revisions in Survival Mode, if the redstone bug bites you, we strongly recommend playing around in Creative Mode to test out your ideas.

Although we love incorporating redstone into our Survival Mode worlds, we'll be the first to tell you that we field test nearly everything in Creative

Mode first to make sure we know what the heck we're doing, and not wasting time and resources in Survival Mode.

Next Lesson: Creating Custom Minecraft Maps

Early on in the first lesson we created our first Minecraft world and didn't put much time or care into the process. The focus back then was on getting right into playing the game. Once you're more familiar with the game, however, it's really fun to create custom maps, use map seeds so that you can play maps other players have shared with you, and otherwise enhance your single player maps.

Using just the tools included with the game you can do all sorts of crazy stuff like make a map that's 200 solid layers of stone for you to mine, mine, and mine some more in or make a map where the middle layer of all the rock and stone is delicious cake!

For homework, fire up a Creative Mode game and play around with some of the techniques we've covered in today's lesson. Build something out of redstone like our Iron Man'esque automatic armor dispenser, the auto-furnace, or whatever your engineering heart desires.

As we mentioned earlier in the lesson, the sheer number of creative things people have done with redstone is amazing. Poke around the internet to uncover redstone related discussions, tutorials, and how-to videos. You'll be blown away by the things people build.